Important Rules to Remember !!

Exponent Laws

Product of powers:	$a^m \cdot a^n = a^{m+n}$
Quotient of powers:	$a^m \div a^n = a^{m-n}, a \neq 0$
Power of a power:	$(a^m)^n = a^{mn}$
Power of a product:	$(ab)^m = a^m b^m$
Power of a quotient:	$\left(\dfrac{a}{b}\right)^m = \dfrac{a^m}{b^m}, b \neq 0$

What happens when there's more than one base?

1. $a^4 \times a^{-4} \times b^3 \times a^2 \times b^{-4}$

$= \underline{a^4} \times \underline{a^{-4}} \times \underline{b^3} \times \underline{a^2} \times \underline{b^{-4}}$

$= a^2 \times b^{-1}$

$= a^2 \times \left(\dfrac{1}{b}\right)^1$

$= \dfrac{a^2}{b}$

2. $(a^3b^2)^3$

$= a^9b^6$

3. $$\frac{(a^5b^3)^2}{a^3b^{-2}}$$

$$= \frac{a^{10}b^6}{a^3b^{-2}}$$

$$= a^{10-3}b^{6-(-2)}$$

$$= a^7b^8$$

$$\frac{(a^5b^3)^2}{a^3b^{-2}}$$

$$= \frac{a^{5\cdot2}\ b^{3\cdot2}}{a^3 b^{-2}}$$

$$= \frac{a^{10}\ b^6}{a^3 b^{-2}}$$

$$= a^{10-3}\ b^{6-(-2)}$$

$$= \boxed{a^7 b^8}$$

4. $\dfrac{10c^8d^{-2}}{2c^4d^5}$ $= 5c^4d^{-7} = \dfrac{5c^4}{d^7}$

$$= 5c^4d^{-7}$$

$$= \frac{5c^4}{d^7}$$

5.

$$\frac{(4d^3c^{-3})(3d^6c^7)}{(2d^3c)^2}$$

multiply

$$= \frac{12d^9c^4}{4d^6c^2}$$

$$= 3d^3c^2$$

Homework

① $\dfrac{a^4 b^3 \times 12 a b^{-3}}{(2a^{-2}b^3)^2}$

$= \dfrac{12 a^{4+1} b^{3+(-3)}}{2^{1\cdot2} a^{-2\cdot2} b^{3\cdot2}}$

$= \dfrac{12 a^5 b^0}{2^2 a^{-4} b^6}$

$= \dfrac{12 a^5 b^0}{4 a^{-4} b^6}$

$= 3 a^{5-(-4)} b^{0-6}$

$= 3 a^9 b^{-6}$

$= \boxed{\dfrac{3a^9}{b^6}}$

② $\left(\dfrac{4 m^5 n^{-2} \times 2 m^{-3}}{2 m^2} \right)^2$

$= \left(\dfrac{8 m^{5+(-3)} n^{-2}}{2 m^2} \right)^2$

$= \left(\dfrac{8 m^2 n^{-2}}{2 m^2} \right)^2$

$= \left(4 m^{2-2} n^{-2} \right)^2$

$= \left(4 m^0 n^{-2} \right)^2 \quad \longrightarrow m^0 = 1$

$= \left(\dfrac{4}{n^2} \right)^2$

$= \dfrac{(4)^2}{(n^2)^2}$

$= \boxed{\dfrac{16}{n^4}}$

③ $\left[\dfrac{x^3 y^4 \cdot x^{-7}}{x^5 \left(y^{-2}\right)^3}\right]^3$

$= \left(\dfrac{x^{-4} y^4}{x^5 y^{-6}}\right)^3$

$= \left(x^{-9} y^{10}\right)^3$

$= x^{-27} y^{30}$

$= \boxed{\dfrac{y^{30}}{x^{27}}}$

④ $\dfrac{5m^2 n^{-3}}{1} \times \dfrac{9m^3 n^2}{3m^{-2}}$

$= \dfrac{45 m^5 n^{-1}}{3m^{-2}}$

$= 15 m^7 n^{-1}$

$= \boxed{\dfrac{15m^7}{n^1}}$

⑤ $(a^5 b^{-2})^3 \times 3b^4$

$= a^{15} b^{-6} \times 3b^4$

$= 3a^{15} b^{-2}$

$= \dfrac{3a^{15}}{b^2}$

⑥ $\dfrac{8a^2 b^0}{a^{-3} b^5}$

$= 8a^5 b^{-5}$

$= \dfrac{8a^5}{b^5}$

⑦ $\dfrac{\left(10ab^{-3}\right)^{2} \times \left(2a^{-1}b^{2}\right)^{2}}{10^{2}a^{4}b^{-2}}$

$= \dfrac{100a^{2}b^{-6} \times 4a^{-2}b^{4}}{100a^{4}b^{-2}}$

$= \dfrac{100a^{0}b^{-2}}{100a^{4}b^{-2}}$

$= 4a^{-4}b^{0}$ $b^{0}=1$

$= \dfrac{4}{a^{4}}$

⑧ $\dfrac{\left(x^{4}y^{4}\right)^{2}}{\left(x^{-3}\right)^{2}y^{5}}$

$= \dfrac{x^{8}y^{8}}{x^{-6}y^{5}}$

$= \boxed{x^{14}y^{3}}$

⑨ $\left(\dfrac{10a^2 b^{-3}}{2a^{-3}b^2}\right)^2$

$= \left(5a^5 b^{-5}\right)^2$

$= 25a^{10} b^{-10}$

$= \boxed{\dfrac{25a^{10}}{b^{10}}}$

⑩ $\dfrac{4^2 u^{-1} v^4}{\left(2u^3 v\right)^3}$

$= \dfrac{16 u^{-1} v^4}{8u^9 v^3}$

$= 2u^{-10} v^1$

$= \boxed{\dfrac{2v}{u^{10}}}$

(11) $\dfrac{4b^{-5} \times 2a^7}{2^2 b^{-3} a^5}$

$= \dfrac{8a^7 b^{-5}}{4a^5 b^{-3}}$

$= 2a^2 b^{-2}$

$= \boxed{\dfrac{2a^2}{b^2}}$

(12) $\left(\dfrac{3x^2 y^3}{x^2}\right)^3$

$= \left(3x^0 y^3\right)^3$

$= 27x^0 y^9$

$= \boxed{27y^9}$

⑬ $x^{1/2} y^3 \cdot x^{2/3} y^{1/3}$

$= x^{\frac{1}{2}+\frac{2}{3}} \; y^{\frac{3}{1}+\frac{1}{3}}$

$= x^{\frac{3}{6}+\frac{4}{6}} \; y^{\frac{9}{3}+\frac{1}{3}}$

$= \boxed{x^{7/6} \, y^{10/3}}$

⑭ $\dfrac{a^{1/4} \, b^{2}}{a^{1/3} \, b^{1/2}}$

$= a^{1/4 - 1/3} \; b^{2 - 1/2}$

$= a^{3/12 - 4/12} \; b^{4/2 - 1/2}$

$= a^{-1/12} \, b^{3/2}$

$= \boxed{\dfrac{b^{3/2}}{a^{1/12}}}$

$$\frac{3}{6} = \frac{1}{2}$$

$$\frac{12}{15} = \frac{4}{5}$$

⑤ $\left(\dfrac{16}{625}\right)^{1/4}$

$= \dfrac{\left(\sqrt[4]{16}\right)^1}{\left(\sqrt[4]{625}\right)^1}$

$= \dfrac{\sqrt[4]{2 \times 2 \times 2 \times 2}}{\sqrt[4]{5 \times 5 \times 5 \times 5}}$

$= \dfrac{2}{5}$

(11) $$\left(\frac{-8}{5}\right)^{\frac{7}{4}} \cdot \left(\frac{-8}{5}\right)^{\frac{1}{4}}$$

$$= \left(\frac{-8}{5}\right)^{\frac{7}{4} + \frac{1}{4}}$$

$$= \left(\frac{-8}{5}\right)^{\frac{8}{4}}$$

$$= \left(\frac{-8}{5}\right)^{2}$$

$$= \frac{(-8)^{2}}{(5)^{2}}$$

$$= \frac{(-8) \cdot (-8)}{(5) \cdot (5)}$$

$$= \boxed{\frac{64}{25}}$$

Simplify

b) $\left(\dfrac{5^6 x^3 y^5}{5^1 x^{-2} y^3} \right)^3$

$\left(5^{6-1} \; x^{3-(-2)} \; y^{5-3} \right)^3$

$\left(5^5 x^5 y^2 \right)^3$

$5^{5 \cdot 3} \; x^{5 \cdot 3} \; y^{2 \cdot 3}$

$\boxed{5^{15} \, x^{15} \, y^6}$

$$(81)^{-1/3}$$

$$= \left(\frac{1}{81}\right)^{1/3}$$

$$= \frac{\sqrt[3]{1}}{\sqrt[3]{81}}$$

$$= \frac{\sqrt[3]{1 \times 1 \times 1}}{\sqrt[3]{3 \times 3 \times 3 \times 3}}$$

$$= \frac{1}{3\sqrt[3]{3}}$$

Review Unit #2

① c) $0.81^{-1/2}$

$= \left(\dfrac{81}{100}\right)^{-1/2}$

$= \left(\dfrac{100}{81}\right)^{1/2}$

$= \dfrac{\sqrt{100}}{\sqrt{81}}$

$= \boxed{\dfrac{10}{9}}$

⑱ $\dfrac{-3a^{-3}b^{-7}c^{-6}}{12a^{-6}b^{-3}c^{-3}}$

$= \dfrac{-1\,a^{\color{red}{-3-(-6)}}\quad b^{\color{red}{-7-(-3)}}\quad c^{\color{red}{-6-(-3)}}}{4}$

$= \dfrac{-1a^{3}b^{-4}c^{-3}}{4}$

$= \boxed{\dfrac{-1a^{3}}{4b^{4}c^{3}}}$